CLAIMS

1. A transparent substrate provided with a thin-film multilayer comprising at least one functional metal layer, especially a silver-based layer, having reflection properties in the infrared and/or in the solar radiation range, at least one metal barrier layer in contact with the functional layer and at least one upper dielectric layer, characterized in that at least one barrier layer is based on zirconium and in that the upper dielectric layer comprises at least one ZnO-based layer in contact with the functional layer or with the barrier layer.

2. The substrate as claimed in claim 1, characterized in that the functional layer is coated with a zirconium-based upper barrier layer surmounted at least by a ZnO-based dielectric layer.

3. The substrate as claimed in claim 2, characterized in that it includes, beneath the silver, a lower barrier layer based on a metal such as titanium, nickel-chromium, niobium, zirconium, etc.

4. The substrate as claimed in claim 1, characterized in that it includes a zirconium-based lower barrier layer and an ZnO-based upper dielectric layer in direct contact with the functional metal layer.

5. The substrate as claimed in one of the preceding claims, characterized in that it includes an upper mechanical protection layer based on an oxide, nitride and/or oxynitride, especially SnO_2, TiO_2, $ZnSnO_x$, $ZnTiO_x$, $ZnZrO_x$ and/or Si_3N_4, this upper layer being optionally doped.

6. The substrate as claimed in one of the preceding claims, characterized in that the thickness of a barrier layer is less than or equal to 6 nm, in particular between 0.2 and 6 nm.

7. The substrate as claimed in any one of the preceding claims, characterized in that the thickness of said functional layer is from 5 to 18 nm.

8. The substrate as claimed in any one of the preceding claims, characterized in that the thickness of said dielectric layer is at least 5 nm, especially between 5 and 25 nm.

9. The substrate as claimed in one of the preceding claims, characterized in that said multilayer substantially retains its properties, especially optical properties, after a heat treatment at a temperature of at least 500°C.

10. The substrate as claimed in any one of the preceding claims, characterized in that at least one Zr-based barrier layer is deposited by magnetron sputtering using a zirconium metal target that may optionally contain from 1 to 10% by weight of an additional element such as Ca, Y, or Hf.

11. The substrate as claimed in any one of the preceding claims, characterized in that the multilayer includes a lower dielectric layer based on an oxide or nitride.

12. The substrate as claimed in claim 11, characterized in that the lower dielectric layer comprises the sequence $SnO_2/TiO_2/ZnO$.

13. The substrate as claimed in claim 11, characterized in that the lower dielectric layer comprises the sequence Si_3N_4/ZnO.

14. Low-emissivity or solar-protection glazing, and especially laminated glazing or double glazing, incorporating at least one substrate as claimed in any one of the preceding claims.

15. The glazing as claimed in claim 14, characterized in that it comprises at least one substrate according to the invention mounted with another substrate as double glazing and the assembly has a light transmission of between 40 and 90%.

16. The glazing as claimed in either of claims 14 and 15, characterized in that has a selectivity defined by the ratio of the light transmission to the solar factor, T_L/SF of between 1.1 and 2.1.

17. A method of improving the mechanical strength of a transparent substrate provided with a thin-film multilayer comprising at least one functional metal layer, especially a silver-based layer, having reflection properties in the infrared and/or in the solar radiation range, at least one metal barrier layer in contact with the functional layer and at least one upper dielectric layer, characterized in that at least one functional metal layer, a Zr-based lower and/or upper barrier layer,

respectively on and/or under said functional metal layer, and a ZnO-based upper dielectric layer are deposited on the substrate by sputtering.